CHAPTER IX
Profitability and Structure of Aggregate Capital Investment Expenditure

In this chapter we have studied the relationship between two variables viz., profitability and the structure of aggregate capital investment expenditure \( K \) of the established firms belonging to the respective industries.

It is important to note here that our definition of the structure of aggregate capital investment expenditure \( K \) implies in fact the ratio of expenditure for non-productive purpose to the expenditure for productive purpose measured in monetary terms. We have, in fact, embarked on our investigation to explore whether or not there is the existence of any relationship between the degree of product differentiation and the structure of aggregate capital investment expenditure in the established firms in a differentiated oligopoly. In other words, whether or not in a developing country like India product differentiation exerts any influence upon the structure of aggregate capital investment expenditure of the established firm is an issue which has been investigated in this sample study.

The degree of product differentiation can never conceptually be related to the variable \( K \) directly, because \( K \) is a variable which, as per definition, depends upon profitability of the firm concerned. In the previous chapter we have assumed that there exists a functional relationship between profitability
and product differentiation. The variable \( K = 1/V \) is composed of the factors which are again depending upon owned and borrowed money capital and the amount of profit reaped by a firm. In fact, the expenditure in the production sector on variable factors and fixed factors depends on the amount of reserve fund, profitability, borrowing and fund collected by selling debentures and from tangible assets held by the firm.

In Chapter VII we have the assumption \([t]\) which has established a functional relationship between this period's reserve and profit of the previous period. Correspondingly, one of the factors constituting the variable \( p_t \) is a function of profitability although it is a lagged function. Secondly, expenditure incurred in selling effort of this period being a variable again dependent upon a part of the previous period's reserve and borrowing we can assume a functional relationship between the degree of product differentiation and profit of the previous period in so far as such profit is added to reserve.

However, instead of using this type of functional relationship between the degree of product differentiation and profitability we do rather maintain the type of relationship between these two variables as expressed in Chapters VII and VIII and we write the function as:

\[
[n] \quad \pi_t = \beta + \gamma_{t-1}
\]

Regarding the relationship assumed between the variables I and \( \pi_t \) we can say that the variables used for the composition of I are in
fact dependent on $t$ since a firm's reserves depend solely on the size of its profit. Corresponding to the conceptual framework of this study

\[ R_t = a + b n_{t-1} \]

where $R_t$ denotes reserves of this period, $a$ is a constant denoting the fund collected as donation and profit accrued from the subsidiary companies in the previous period and also subsidiaries [if any] received by the firm in the previous period and $b$ is a co-efficient relating $R_t$ to the profit of the previous period.

Secondly, expenditure in production sector \([pE]\) being partly made out of the reserve fund of the previous period it again depends upon the size of profit i.e.,

\[ pE_t = d + c R_{t-1} \]

or \[ pE_t = d + c(a + b n_{t-2}) = d + ce + cb n_{t-2} \]

where $pE_t$ means expenditure incurred in the production sector in period $t$, $d$ is a constant denoting the funds coming from borrowing and from selling debentures. Thus we can assume a two period lag between $pE$ and $n$. Correspondingly, it follows that whatever may be the lag value $pE$ is functionally related to profitability as $I$ bears a functional relation to profitability and so we can express this relation in general form

\[ K = f(I) \]

\[ r = g(L) \]
Thus \( k = f \left[ g \left( t \right) \right] \) is a composite function. To find out the relationship between \( k \) and \( t \) we use

\[
\frac{dk}{dt} = \frac{dk}{dy} \cdot \frac{dy}{dt}
\]

Since this is a product function, the question of using multiple regression in an empirical study does not arise. Therefore, in our study we have first regressed \( y \) upon \( L \) (vide Chapter VIII) and then regressed \( k \) upon \( y \) in this Chapter.

Now, in accordance with our conceptual framework, if the degree of product differentiation increases and it leads to an increase in the value of \( k \), then from the social point of view the wastage of social productive capacity gets increased. About this concept we have already mentioned in the 'Introductory Chapter' of this study. So, we do not feel further discussion to be necessary.

In the case of ten established firms in the respective industries investigated, the investigation has been conducted according to the terms of reference. Data of the time series of \( k \) and \( y \) of the firms involve different time periods according to the availability of the data.

We have here also assumed the existence of a linear functional relationship between \( k \) and \( y \) as suggested by the scatter diagrams.

Moreover, as the sample size is small we have subjected the co-efficient 'b' of each regression equation to 'T' test at 5%.
level of significance. The normal deviates and the test statistic
used in this Chapter are the same as those used in Chapter VII
and VIII. Table 27 and 28 set out the estimating equations for
the ten established firms and the result of the 'T' test together
with the standard error of the regression coefficients respec-
tively.

<p>| TABLE - 27 |
|-----------------|------------------|
| Relation (Linear Regression) between Structure of aggregate capital investment expenditure and profitability. |</p>
<table>
<thead>
<tr>
<th>Established firms in industries</th>
<th>Estimating equations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tea</td>
<td>$K' = 2.4287 - 2.5098 \gamma$</td>
</tr>
<tr>
<td>2. Biscuits</td>
<td>$K' = 1.4943 - 0.5526 \gamma$</td>
</tr>
<tr>
<td>3. Rubber goods</td>
<td>$K' = 1.2553 - 2.719 \gamma$</td>
</tr>
<tr>
<td>4. Cigarettes</td>
<td>$K' = 1.56 - 10.4503 \gamma$</td>
</tr>
<tr>
<td>5. Bicycles</td>
<td>$K' = 1.138 - 1.807 \gamma$</td>
</tr>
<tr>
<td>6. Automobile</td>
<td>$K' = 1.079 - 0.906 \gamma$</td>
</tr>
<tr>
<td>7. Cosmetics</td>
<td>$K' = 1.04 + 0.1512 \gamma$</td>
</tr>
<tr>
<td>8. Electrical goods</td>
<td>$K' = 1.663 - 9.23 \gamma$</td>
</tr>
<tr>
<td>9. Cotton textiles</td>
<td>$K' = 0.6122 + 9.4972 \gamma$</td>
</tr>
<tr>
<td>10. Medicines and Drug</td>
<td>$K' = 1.70545 - 0.60316 \gamma$</td>
</tr>
</tbody>
</table>

Corresponding to these ten estimating equations we have
tested the hypothesis

$H : \text{There exists no such relationship in the universe as obtained in the sample between } K \text{ and } \gamma.$

Accordingly $\beta = 0$, The hypothesis is rejected if either

$t < -t_{\alpha/2, n-2}$ or $t > t_{\alpha/2, n-2}$ at the 5% level of signi-

ficance.
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Firms</th>
<th>Calculated value t</th>
<th>N - 2</th>
<th>Tabulated 5%</th>
<th>S.E. of 'b'</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tea</td>
<td>-2.479</td>
<td>17</td>
<td>2.110</td>
<td>1.0045</td>
</tr>
<tr>
<td>2</td>
<td>Biscuits</td>
<td>-0.367</td>
<td>13</td>
<td>2.160</td>
<td>2.720</td>
</tr>
<tr>
<td>3</td>
<td>Rubber goods</td>
<td>-3.605</td>
<td>9</td>
<td>2.262</td>
<td>6.754</td>
</tr>
<tr>
<td>4</td>
<td>Cigarettes</td>
<td>-1.77</td>
<td>13</td>
<td>2.160</td>
<td>5.914</td>
</tr>
<tr>
<td>5</td>
<td>Bicycles</td>
<td>-2.822</td>
<td>11</td>
<td>2.201</td>
<td>0.640</td>
</tr>
<tr>
<td>6</td>
<td>Automobile</td>
<td>-0.985</td>
<td>13</td>
<td>2.160</td>
<td>0.919</td>
</tr>
<tr>
<td>7</td>
<td>Cosmetics</td>
<td>4.059</td>
<td>11</td>
<td>2.201</td>
<td>0.246</td>
</tr>
<tr>
<td>8</td>
<td>Electrical goods</td>
<td>-1.483</td>
<td>11</td>
<td>2.201</td>
<td>6.260</td>
</tr>
<tr>
<td>9</td>
<td>Cotton textiles</td>
<td>6.762</td>
<td>15</td>
<td>2.131</td>
<td>1.404</td>
</tr>
<tr>
<td>10</td>
<td>Medicine and drugs</td>
<td>-0.193</td>
<td>13</td>
<td>2.160</td>
<td>3.121</td>
</tr>
</tbody>
</table>
The observed $t$ value being greater than the tabulated 5% value in tea, rubber goods, bicycles, cosmetics and cotton textiles — manufacturing established firms, the relationship as observed is considered to be statistically significant.

In view of the slope value of the regression line and its standard error the relationship as found in the established firms manufacturing cigarettes and electrical goods is nearly significant.

As regards the nature of relationship between $K$ and $T$ it is found that in the cases of the established firms producing tea, rubber goods, bicycles, cigarettes and electrical goods the relationship is negative while it is positive in the cases of cosmetics and cotton textiles manufacturing established firms.

In the cases of biscuits, medicines and drugs and automobile manufacturing established firm we have no sufficient evidence to believe that there exists any relationship between $K$ and $T$.

It is important to note here that in view of the relationship statistically significant negative relationship between $K$ and $T$ exists in the intermediate goods producing established firms, while positive relationship is found to be existing in consumer goods producing firms.

Secondly, taking the respective relationship between $K$ and $T$ and $T$ and $L$, both significant and nearly significant, into account it is found that these two different types of relationship
are opposite to each other in the intermediate goods like rubber goods, bicycles and electrical goods manufacturing established firms i.e., when

\[ \frac{dK}{dt} / \frac{dL}{dt} < 0 \quad \text{then} \quad \frac{dY}{dt} / \frac{dL}{dt} > 0 \quad \text{in intermediate goods producing established firms. But in consumer goods producing established firm both relations are of the same nature i.e., while} \]

\[ \frac{dK}{dt} / \frac{dL}{dt} > 0, \quad \frac{dY}{dt} / \frac{dL}{dt} > 0 \quad \text{is found to be existing in cotton textiles manufacturing firm we have found that} \]

\[ \frac{dK}{dt} / \frac{dL}{dt} < 0, \quad \frac{dY}{dt} / \frac{dL}{dt} < 0 \quad \text{is existing in cigarette manufacturing established firm.} \]

Thirdly, one interesting feature emerging from this study is that the majority of the established firms experience a particular relationship between \( K \) and \( Y \), and \( Y \) and \( L \), which again maintains a particular relationship with the nature of the trend of \( L \) over time. It is found that

when \( \frac{d}{dt} (w_2/T_s) < 0 \) then \( \frac{dY}{dt} / \frac{dL}{dt} > 0 \) and \( \frac{dK}{dt} / \frac{dY}{dt} > 0 \)

again when

\[ \frac{d}{dt} (w_2/T_s) > 0 \] then \( \frac{dY}{dt} / \frac{dL}{dt} < 0 \) and \( \frac{dK}{dt} / \frac{dY}{dt} < 0 \)

fourthly, in the cases of two established firms belonging to rubber goods and electrical goods producing industries respectively it is found that when
\[ \frac{d}{dt} \left( \frac{w_2}{TR} \right) > 0 \quad \text{then} \quad \frac{dK}{dt} / \frac{dL}{dt} > 0 \quad \text{and} \quad \frac{dL}{dt} / \frac{dK}{dt} < 0 \]

and in bicycles and biscuits manufacturing firms when
\[ \frac{d}{dt} \left( \frac{w_2}{TR} \right) < 0 \quad \text{then} \quad \frac{dK}{dt} / \frac{dL}{dt} > 0 \quad \text{and} \quad \frac{dL}{dt} / \frac{dK}{dt} < 0 \]

The first expression states while the degree of product differentiation is found to be decreasing overtime the relationship between profitability and the degree of product differentiation on the one hand and profitability and the structure of capital investment expenditure are found to be positive.

The second expression states that while the degree of product differentiation is found to be increasing overtime both relations are found to be negative. The third and the fourth expressions state that both relations are opposite to each other when either the degree of product differentiation is increasing or decreasing overtime.

However, on the basis of the result of the tests of significance at 6% level of the slope of the trend fitted to the time series of \( w_2/\text{TR} \), relationship between \( Y \) and \( K \) and \( Y \) and \( L \) respectively empirical investigation of the composite function
\[ K = f \left( g \left( \lambda \right) \right) \]
reveals the following factors associated with the five established firms.

First, in the cases of the established firms belonging to industries producing rubber goods, electrical goods and bicycles an increase in the degree of product differentiation brings about an increase in profitability and an increase in
profitability leads to a decrease in the structure of aggregate capital investment expenditure.

Second, in the established firm manufacturing cigarettes, an increase in the degree of product differentiation results in a decrease in profitability and a decrease in profitability leads to an increase in the structure of aggregate capital investment expenditure while in the established firm manufacturing cotton textiles an increase in the degree of product differentiation brings about an increase in profitability and an increase in profitability leads to an increase in the value of the structure of aggregate capital investment expenditure.

Third, in the case of the producing firm while the relationship between profitability and the structure of capital investment expenditure is found to be statistically significant the relationship between profitability and the degree of product differentiation is found to be insignificant. Fourth, while the relationship between profitability and the structure of capital investment expenditure is found to be statistically insignificant the relationship between profitability and the degree of product differentiation is found to be statistically significant in the biscuits manufacturing established firm.

Therefore, considering all these cases, calculated value of $t$ and the standard error of '$b$' and also the sources of data the inference drawn in conformity with the assumption of the existence of a composite function $K$ expressed in equation (1) of
this chapter can be regarded as valid in most of the cases considered in this sample study.

The market structure contemplated by us is one in which the trend of the time series of the degree of product differentiation should be found to be increasing while the cross elasticity of the product of a firm with respect to selling effort on both the supply side and the demand side starts assuming a value greater than zero. Correspondingly the direct elasticity with respect to product differentiation is decreasing and therefore, the firm concerned is supposed to increase the value of the allocation coefficient of total expenditure in the selling sector. If profit is to feed the process through the use of reserve fund accumulated out of profit then with increasing degree of product differentiation over time in the firm concerned profitability should decline over time while the magnitude of the structure of aggregate capital investment expenditure should be increasing over time. This theoretically possible phenomenon has found to be present in the cigarette and tea manufacturing firms respectively although in the tea manufacturing firm the relationship between profitability and the degree of product differentiation is not found statistically significant. The possible reasons for the presence of increasing trend of the time series of the degree of product differentiation in these two industries have already been discussed in chapter III. In this context it is necessary to note that while the trend of the degree of product differentiation is found to be increasing over time in the case of an established firm it is
not necessarily expected that profitability should always decline i.e., the relationship between $Y$ and $L$ should always be negative since the firm may also continue to reap scale economies of selling effort, which are mainly responsible for the accrual of profit in practice. Correspondingly, in this situation we may find a positive relationship between the degree of product differentiation and profitability. Then an increase in profitability may again be associated with a decline in the magnitude of the structure of aggregate capital investment expenditure when the assets in the form of the reserve fund is diverted, which leads to the creation of subsidiary companies. Secondly, the position of the firm may be such that no need for the increase in the value of the allocation coefficient of total expenditure in the selling sector arises and if at all needed, it is not met by reinvesting gradually a major portion of profit at each point of time. Therefore, the value of $K$ may increase at a slower rate than the value of $Y$. Here the firm is supposed to be facing less formidable competition from its rivals and so the value of the cross elasticity of the commodity of the firm with respect to product differentiation on the supply side is supposed to have value near zero; but the cross elasticity with respect to product differentiation on the demand side is normally expected to be assuming a value more than zero. Therefore, the existence of a negative relationship between $K$ and $Y$ and positive relationship between $Y$ and $L$ is not unlikely and this situation is prevailing in the rubber goods and electrical goods manufacturing established firm.
Realisation of scale economies of selling effort in the case of an established firm is normally associated with a decreasing trend of the time series of the degree of product differentiation. We have already pointed out the reason for the realisation of scale economies of selling effort. Now, the decreasing trend of $L$ also indicates that competition in the non-price area is not keen in any way. Correspondingly, the degree of product differentiation is supposed to be positively related with profitability and increase in profitability leading to the augmentation of the reserve fund and share capital through the floating of bonus shares, is expected to have profitability bearing a positive relationship with the structure of aggregate capital investment expenditure. This phenomenon is found to be present in the cotton textile and cosmetic good producing established firms although in the cosmetic goods producing firm the relationship between profitability and the degree of product differentiation is found to be statistically insignificant.

Also, while $L$ has been decreasing and $T$ has been increasing overtime the variables representing assets of the firm may decline due to investment in other industries as we have found in the case of rubber goods manufacturing firm.

The situation arises when the firm thinks that increasing value of the reserve fund, share capital or the allocation coefficient of total expenditure in selling sector is not necessary to keep its market share or market position undisturbed. This is possible when the growth rate of demand for the commodity produced
by the firm is sufficiently high to pay off the firm by over
coming the negative effect exerted upon its sale by its rivals.
We have found this very situation in the bicycle manufacturing
established firm when K and 7 are negatively related. Thus we
have offered possible reasons for the existence of a different
nature of relationship between the structure of aggregate capital
investment expenditure and profitability on the one hand and the
nature of relationship between the structure of aggregate capital
investment expenditure and the degree of product differentiation
on the other which are found to be statistically significant in
the established firms belonging to different industries.

One conclusion that emerges from this study is that
there is not sufficient evidence to believe that product diffe-
rentiation will always have a positive effect upon profitability.
It depends on the situation prevailing in the market, the position
of the established firm in the market, the demand and supply of
the commodity and also the general state of economic development
of the country.